2. BACKGROUND

2.1 General

This section describes the framework and rationale (i.e., Site setting and regulatory history) for constructing the Groundwater Remedy. Lehigh has performed site-specific environmental investigations and mitigation efforts since the late 1980s. For the purposes of this EDR, certain sections may contain summaries of the historical documents insofar as they contain information that affects the design of the Groundwater Remedy. Otherwise these documents are included by reference. Following this background, this section culminates by describing the goals of the CAP as listed in the CD.

2.2 Site Location and Layout

Figure 1-1 shows the Site location and the existing Site layout. The Site is located in a remote area of Washington State approximately 100 miles north of Spokane and 13 miles south of the Canadian border. Lehigh owns the property on which the Closed CKD Pile is located, in addition to land north and hydraulically downgradient of the Closed CKD Pile along Sullivan Creek (approximately 14 acres total). The majority of construction will occur on the relatively flat area east of State Route 31, between State Route 31 and Sullivan Creek. The Closed CKD Pile lies on approximately 7 acres of Lehigh's property adjacent to and west of State Route 31 across from where the majority of construction will occur. The Closed CKD Pile rises approximately 90 ft above State Route 31 at a slope of 2H:1V (Horizontal to Vertical) to a gently sloping upper deck with a maximum elevation of approximately 2,132 feet above mean sea level (ft MSL). The gravity drain will be installed from the relatively flat area east of State Route 31 to the area adjacent to the top deck of the Closed CKD Pile.

2.3 Site Description and Regulatory Overview

2.3.1 Summary of Remedial Investigation (RI) and Feasibility Study (FS) Activities

Several environmental investigations have been conducted prior to and after pile closure to evaluate the CKD Pile and its effects on groundwater. The results of these investigations, which form the basis for design of the Groundwater Remedy, are described in project documents, including:

- Preliminary Site Characterization Report [D&M, 1992];
- Addendum, Preliminary Site Characterization Report [D&M, 1993];
- Post-Closure Care Groundwater Monitoring Data Review [GeoSyntec, 1999];
- Final Remedial Investigation Report [GeoSyntec, 2001];
- Feasibility Study Technical Memorandum [GeoSyntec, 2003];
- Summer 2004 Investigation Report [Ecology, 2004]; and
- Feasibility Study Technical Report [GeoSyntec, 2005].

Considering the data presented during the RI, Lehigh conducted a feasibility study (FS) of potential remedial systems to address the CKD-affected groundwater. A screening-level FS document was submitted to Ecology that included the results of a comparison of over 20 remedial alternatives. Following the WAC-prescribed screening and detailed review, six alternatives were evaluated in greater detail. Results of this process were documented in the Feasibility Study Technical Report (FSTR) [GeoSyntec, 2005].

Ecology used the information provided in project documents to select the Groundwater Remedy described in the CAP, as implemented by the CD. The FS

process culminated in the selection of the Groundwater Remedy summarized in the CD. The process flow diagram and conceptual rendering of the Groundwater Remedy are presented in Figures 2-2 and 2-3, respectively, and the components are described in Section 3.

In addition, engineering data were presented to Ecology in the Engineering Report (ER) submitted in March 2006 as part of the National Pollutant Discharge Elimination System (NPDES) permit process [GeoSyntec, 2006]. The following sections contain a summary of information from these documents pertinent to the Groundwater Remedy design.

2.3.2 Site Geology

Based on the information gathered during the RI, two geologic strata at the Site are relevant to the Groundwater Remedy systems to be installed at the Site: glacial sediments and Holocene alluvium [GeoSyntec, 2005]. The gravity drain component of the Groundwater Remedy will be primarily installed within the glacial sediments underlying the Closed CKD Pile. The funnel-and-gate components of the Groundwater Remedy will be installed within the alluvium downgradient of the Closed CKD Pile. These components are described in more detail in Section 3.

- Glacial Sediments. Overlying the bedrock[1] are glacial sediments composed of glaciofluvial (river terrace) and glaciolacustrine (glacial lake) sediments that consist of sandy silt and clayey silt. The glacial sediments are subject to landsliding. Immediately to the south of the Closed CKD Pile is an historic landslide [D&M, 1997]. The historic landslide consists of disturbed sediments to an unknown depth along unknown slip planes. This area above the landslide rises in steep relief progressing south from the Closed CKD Pile.

- Holocene Alluvium. Sullivan Creek eroded a bowl into the glacial sediments. The creek deposited gravels with occasional cobbles and

[1] See the RI for data about the bedrock, which is not considered relevant to this EDR.

boulders and interspersed zones of more clayey, silty, and sandy materials into the base of the bowl and on the floodplain. This layer is generally about 20 ft thick and overlays the glacial sediments.

The geology of the Site is a critical consideration of the engineering design and construction of the Groundwater Remedy, as it includes extensive subsurface activity. The geology will dictate the speed and extent of the construction to be performed.

2.3.3 Site Hydrogeology and Sullivan Creek Hydrology

The sources of groundwater at the Site include precipitation, upland recharge through the glacial sediments and Holocene alluvium, and, to a lesser extent, Sullivan Creek flow [GeoSyntec, 2005 and USGS, 2003].

The shallow groundwater levels that are present in the floodplain north of State Route 31 and the groundwater migrating through the upper glacial sediments beneath the Closed CKD Pile will be critical considerations when constructing the Groundwater Remedy. Steps will be taken to control the water flow from the saturated soil layers when installing the Groundwater Remedy. These steps are described in Section 3 for each of the Groundwater Remedy components.

2.3.4 Summary of Environmental Analysis and Sampling Results

During RI activities, Lehigh conducted evaluations of the environmental media at the Site, including the CKD, soil, surface water, and groundwater. Data are summarized in Appendix A. Findings of the RI activities include:

- CKD – Samples indicated that the CKD primarily consists of alkaline materials, such as calcium oxide. The chemical analytical results indicated that metals concentrations were generally below soil background concentrations and regulatory screening levels [D&M, 1992].

- Soil – The soil samples were characterized by pH values from approximately 7.7 to 10.8 standard units. Soil metals concentrations (for the Site indicator metals, each in milligram per kilogram, mg / kg): arsenic (<0.75 to 13.8), chromium (2.1 to 131), lead (2.6 to 93), and manganese (23.7 to 470). Organic constituents were generally not detected above laboratory detection limits.

- Surface Water – Water quality within Sullivan Creek upgradient and downgradient of the Site does not vary significantly [EIP, 1999]. For the indicator substances used for the Groundwater Remedy, data indicate that pH is between 8.4 and 8.49 standard units and concentrations for arsenic, chromium, and lead were below laboratory detection limits (manganese was not analyzed).

- Groundwater – The affected groundwater plume encompasses approximately 2.5 acres. The following is a summary of the effects of the Closed CKD Pile on the Site groundwater:

  - The Site groundwater table elevation under the Closed CKD Pile fluctuates seasonally and annually depending on precipitation and runoff conditions.

  - Groundwater contacts portions of the base of the Closed CKD Pile from underneath in the alluvial floodplain, as well as from seepage contacting the CKD along the glacial deposits. The groundwater pH increases as a result of the contact with CKD.

  - The high pH groundwater causes naturally occurring metals in the Site soils to dissolve into the groundwater. These metals, including arsenic, lead, and chromium, are not present in significant concentrations within the CKD, however.

– Groundwater treatment with carbon dioxide causes naturally occurring manganese to dissolve into the groundwater as other indicator substance metals precipitate.

2.3.5 Regulatory Overview and CAP Goals

The CD describes the regulatory history of the Site, including the history of on-site CKD management activities, CKD landfill closure activities, and groundwater assessment and remediation activities. The RI / FS activities were performed under the Ecology Model Toxics Control Act (MTCA) requirements. Ecology used the information from the RI/FS activities to select the Groundwater Remedy described in the CAP. In accordance with the CD which implements the CAP, Lehigh will construct and operate the Groundwater Remedy to address the CKD-affected groundwater that continues to migrate from the Closed CKD Pile. Lehigh performs post-closure care and maintenance activities for the Closed CKD Pile as described in the Post-Closure Care and Maintenance Plan [D&M, 1995], which is also incorporated into the CD. Table 2-1 summarizes the existing cleanup levels required by the CD.

After reviewing the project, Ecology issued a Determination of Nonsignificance (DNS) for the impacts of the proposed Groundwater Remedy on the environment in accordance with the State Environmental Policy Act (SEPA). Also, because the project is a MTCA cleanup action, it is exempt from obtaining state and local permits. Ecology instead compiles the substantive requirements of these permits and provides them to Lehigh. The substantive requirements are similar to permit conditions that will be followed during Groundwater Remedy implementation. The Groundwater Remedy is also subject to federal permit requirements under the Clean Water Act (National Pollutant Discharge Elimination System and Section 404 Dredge and Fill permits) and Rivers and Harbors Act. On 5 January 2006 the United States Army Corps of Engineers (USCOE) issued authorization under Nationwide Permit 38 for Lehigh to construct that portion of the Groundwater Remedy that is subject to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. Table 2-2 summarizes the regulatory requirements that result from the substantive requirement lists and the federal permits.

As stated in MTCA, the overall goal of a cleanup action is to have the site-specific indicator substances meet the cleanup levels at a prescribed location on site (i.e., point of compliance). The goals of the site-specific CAP include:

- Implement source control by diverting water away from the Closed CKD through a gravity drain;
- Capture CKD-affected groundwater that migrates from the Closed CKD Pile toward Sullivan Creek;
- Treat the captured groundwater to meet site-specific cleanup levels for pH, arsenic, chromium, lead, and manganese (Table 2-1); and
- Allow the treated groundwater to flow into Sullivan Creek.

This EDR provides the engineering basis for designing, operating, maintaining and monitoring a system that will achieve the CAP goals.